Durant®

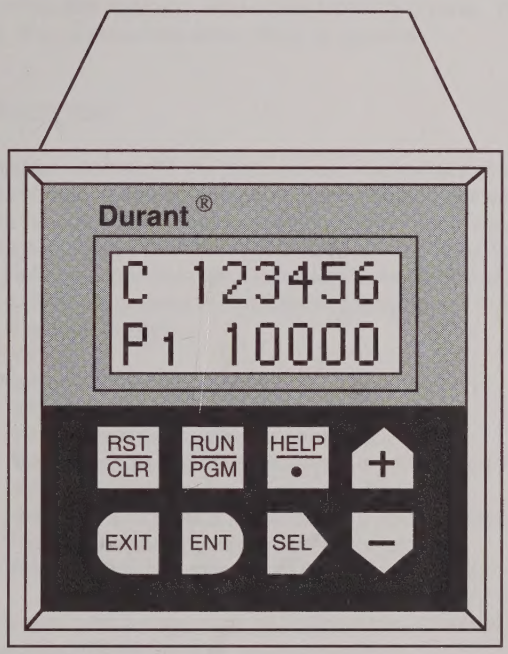
INSTALLATION AND OPERATION MANUAL Number 57600-901-03

AMBASSADOR SERIES COUNT CONTROL

MODELS:

57600-401 (10-15 VDC)
57601-401 (115 VAC)
57602-401 (230 VAC)

NAED ASSOCIATE



- Six Digit, Single Preset Counter
- 1/Tau Rate Meter
- Counter and Rate Meter Scaling
- Four User-Configurable Control Inputs
- One Output Relay
- Two Solid State Outputs
- RS-485 Serial Communications

TABLE OF CONTENTS

1	Introduction
3	Front Panel Features
4	Run-Mode Operation
5	Programming
12	Scale Factors
13	Rear Terminal Description
15	Wiring Diagrams
18	Serial Communications
24	Diagnostics and Troubleshooting
26	Specifications
27	Parts and Accessories

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INTRODUCTION

GENERAL DESCRIPTION

The Durant Ambassador 5760X-401 is a six digit single preset count control device with four programmable inputs, three outputs, and a built in rate meter. The counter has nine count input modes, and may be used to control cut length, fill quantity, or number of pieces/container. Each of the inputs may be programmed for one of six functions. Each of the outputs are independent and have separate pick-up, drop-out, time, latch, and reverse functions.

RATE METER

In addition to count/control capabilities, a rate meter is provided to monitor the speed of the incoming count signal. This rate feature uses the 1/tau method (event time measurement) and can calculate and scale the rate so that even a low count speed (.1 Hz) can yield accurate rates in engineering units (ft/sec, gal/min, etc). The rate feature operates simultaneously with the count/control functions.

PROGRAMMABLE I/O

One of the unique features of the Ambassador family of counters is the programmability of the inputs and outputs. Each of the four inputs can be independently programmed to perform one of six functions. The user can also select which events (counter preset outputs, counter reset inputs, serial commands, output timers, and output control inputs) will cause each of the three outputs (1 relay and 2 transistor) to pick-up and drop-out. Any input(s) may be programmed for output control, however, multiple output control inputs are paralleled into a single output control channel in the unit.

MENU PROGRAMMING

Another unique feature of the Ambassador family of counters is the menu driven programming. The two line alphanumeric display prompts programming choices, thus eliminating the need to remember or look up programming codes. A non-volatile memory retains programming choices, presets, and count values while power is removed.

APPLICATION

To better understand the features and capabilities of the Ambassador, review the simplified block diagram at the top of the next page and the programming diagrams on pages 6 through 9. Because of the Ambassadors's versatility, both programming and wiring decisions must be made before the counter can be operated. The following sequence of activities is recommended:

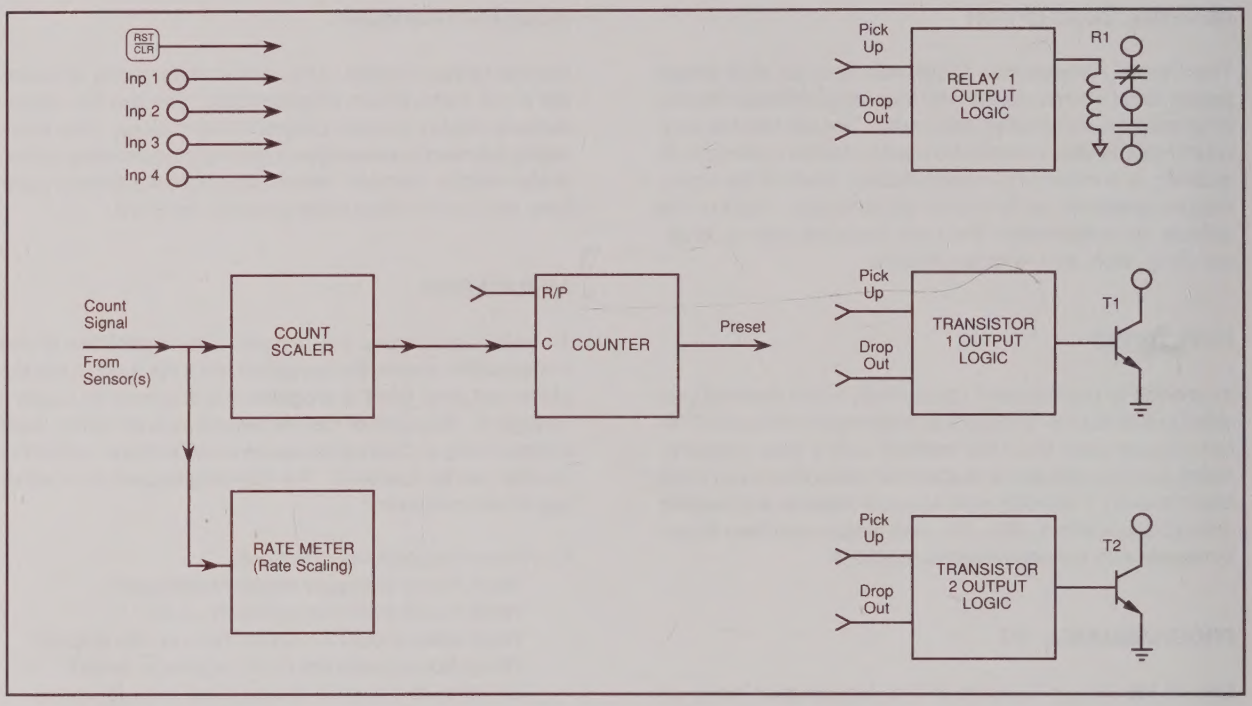
1. Answer the following questions:
   - What should the count register represent?
   - What should each output control or do?
   - What effect should the preset have on the outputs?
   - What should cause the count register to reset?
   - Which control signals should affect outputs (resets, programmable inputs, output timers, etc)?
   - What engineering units should the rate represent?

2. Go through the programming section and mark the choices required for the application.

3. Go through the wiring section and lay out the wiring required. Remember that wiring is affected by programming.

4. Wire and program the counter as determined in steps 2 and 3 above.

BLOCK DIAGRAM/OVERVIEW



COUNT SCALER

Receives the up or down signals and adds or subtracts the scale factor value to/from the current scaler remainder. The scaler outputs the integer result as up or down pulses. The fractional portion of a count remaining is stored in the scaler's memory.

COUNTER

Counts the up and down pulses from the scaler. Every two milliseconds, the counter checks if its value has passed through the preset value (coincidence). For coincidence to occur, the counter must count up to the preset in the reset to zero mode and count down to zero in the reset to preset mode. If coincidence has occurred, the main counter outputs a pulse on the preset output. The main counter counts in the opposite direction if it is programmed to reset to preset.

PROGRAMMABLE INPUTS

The Ambassador unit has five programmable inputs (RST/CLR key and four terminals) . The user may program each input for one of six functions (see INPUTS, page 10).

RELAY AND TRANSISTOR OUTPUT LOGIC

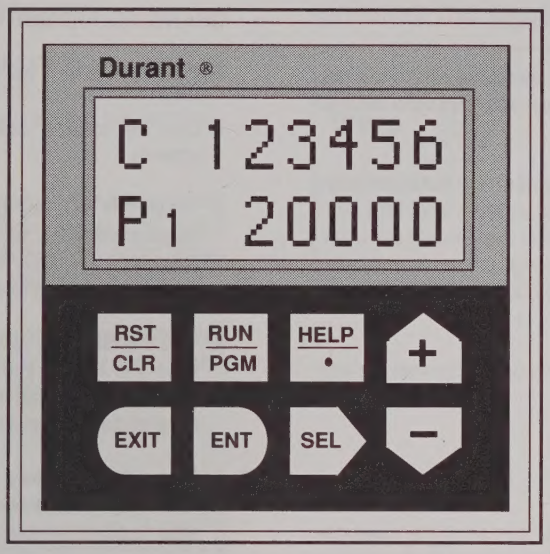
These blocks act like latching relays. When the pick-up input receives a pulse, the output turns on and stays on until it times out or until the dropout input receives a pulse.

RATE METER BLOCK

The Rate Meter Block measures the time duration of a pulse or group of pulses received at input A. It uses this measurement along with the rate scaler to calculate the rate in meaningful units. Internal logic resets the rate meter if the count direction reverses.

FRONT PANEL FEATURES

Two line LCD Display - Shows count, preset, and rate values when unit is in the run mode. Displays programming information when the unit is in the program mode.



Key Functions

RST / CLR

Reset/Clear Key - In the run mode this key can be programmed to reset count values. In the preset editing mode this key zeros presets that are being changed. In the program mode it zeros numeric data that is selected for editing.

RUN / PGM

Run/Program Key - Press this key followed by the Enter key (ENT) to enter the program mode. Pressing this key while in the program mode returns the control to the run mode.

HELP / •

Help/Key - In the run mode this key causes the Help Screens to be displayed. In the program mode this key is used to set the decimal point positions for count and rate scaler displays.

+

Up Arrow/Plus (+) Key - In the run mode this key is used to scroll up through the three different display screens. In the preset editing mode this key adds 1 (increments) to the value of the selected digit each time it is pressed. In the program mode this key is used to step vertically up through the menus and increment the value of selected digits when changing numeric values.

EXIT

Exit Key - In the preset editing mode this key allows the preset editing process to be exited without altering the previous preset value. In the program mode this key exits program changes that have been selected but not yet entered.

ENT

Enter Key - In the run mode this key causes preset changes to take effect. In the program mode it causes the displayed program changes to be entered.

SEL

Select Key - In run mode this key allows the editing of presets and selects individual digits of the preset. In program mode this key is used to move into more detailed menus and selects the digits of numeric values needed for programming.

−

Down Arrow/Minus (-) Key - In the run mode this key is used to scroll down through the three different display screens. In the preset editing mode this key subtracts 1 (decrements) from the value of the selected digit each time it is pressed. In the program mode this key is used to step vertically down through the menus and decrement the value of selected digits when changing numeric values.

RUN MODE OPERATION

SELECTING DISPLAY INFORMATION

This Ambassador control has three available run mode displays. Use the up and down arrow keys to select the desired display.

The selected display will remain on until one of the arrow keys is pressed to cause a change.

The screen selected for display during run-mode only provides information to the operator and does not affect the operation of the control.

If power is removed and restored, the unit will power-up with the display that was last selected.

RUN MODE MENUS

The keystroke sequence used to access all of the available run mode screens and change preset values is shown in a menu format below.

CHANGING PRESET VALUES

The preset value is set as follows:

1. Use the up and down arrow keys to select the preset screen.

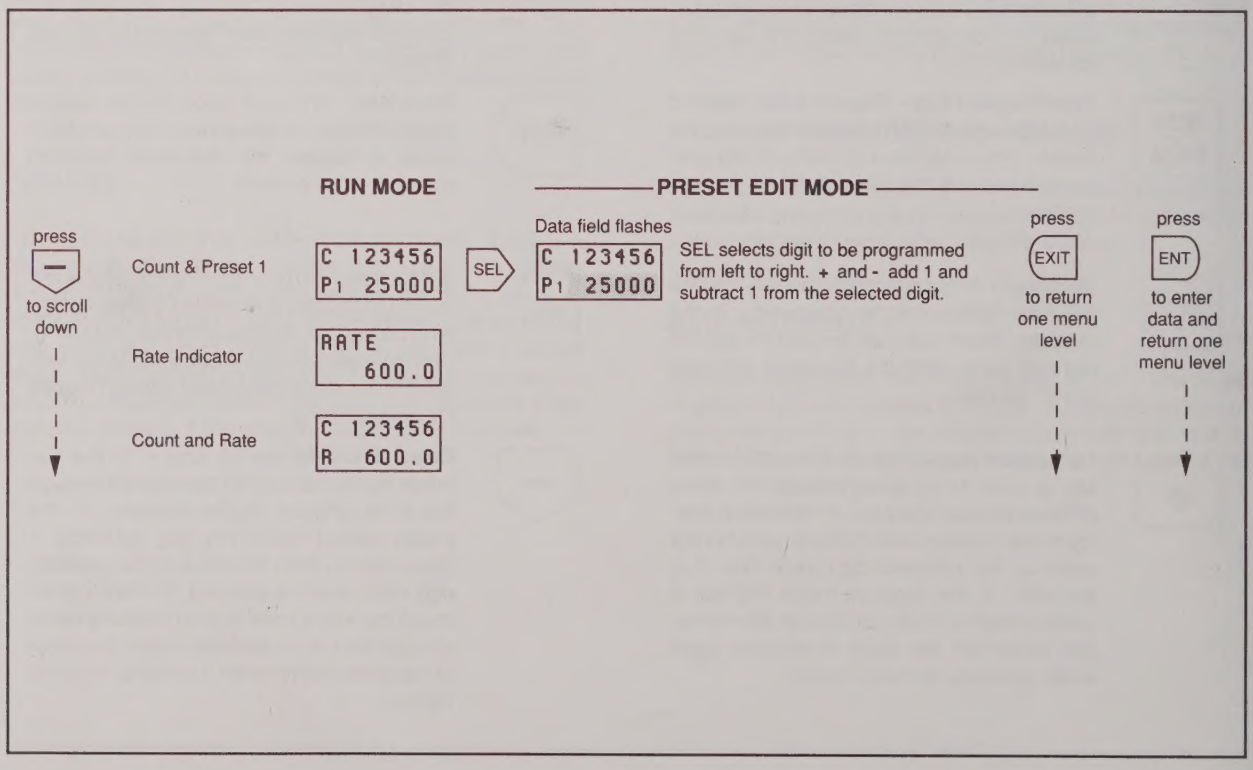
2. Press the SEL key to enter the preset change mode. The display will show all digits of the preset value. The left-most digit will flash indicating that it is currently selected. To set the preset to zero, press the RST/CLR key.

3. Use the SEL key to select the digit to be changed. Each time the key is pressed, the next digit to the right is selected. The digit value can then be changed using the up and down arrow keys.

4. Press the ENT key to enter the new preset value and return to the run mode screens. Press the EXIT key at any time to abort preset changes.

All count and control functions continue to operate when preset value is being changed.

Run Mode Menu Illustration



PROGRAM MODE

INTRODUCTION TO MENU PROGRAMMING

The menu programming format used by the Ambassador series eliminates the need to memorize or look up programming options. Program prompting is provided on the 2 line alphanumeric display.

The programming menus are organized in a manner much like an outline. The main menu items are located out to the far left column and each successive subdivision of these main items is located one column further to the right.

The keystroke sequences to select all of the programmable options are shown in the programming charts on pages 7-10. The seven main menus are shown below.

Overview of Main Menus

press [−] to scroll down

PROGRAM SCALERS	Enter count scale factor and decimal point, rate scale factor and decimal point.
PROGRAM COUNT IN	Select count mode, reset to zero or reset to preset and auto-recycle operations.
PROGRAM INPUTS	Select the input function to be performed by each to the four programmable inputs.
PROGRAM OUT MODE	Select normal or reverse logic, latched or pulsed, pick-up and drop-out events.
PROGRAM SER PORT	Select the unit I.D. number, baud rate, parity, and transmission delay.
PROGRAM SER OUT	Select the data items to be transmitted when a serial group print command (RCD7) is received.
PROGRAM OPTIONS	Select the run mode function of the front panel RST/CLR key. Restore factory programming.

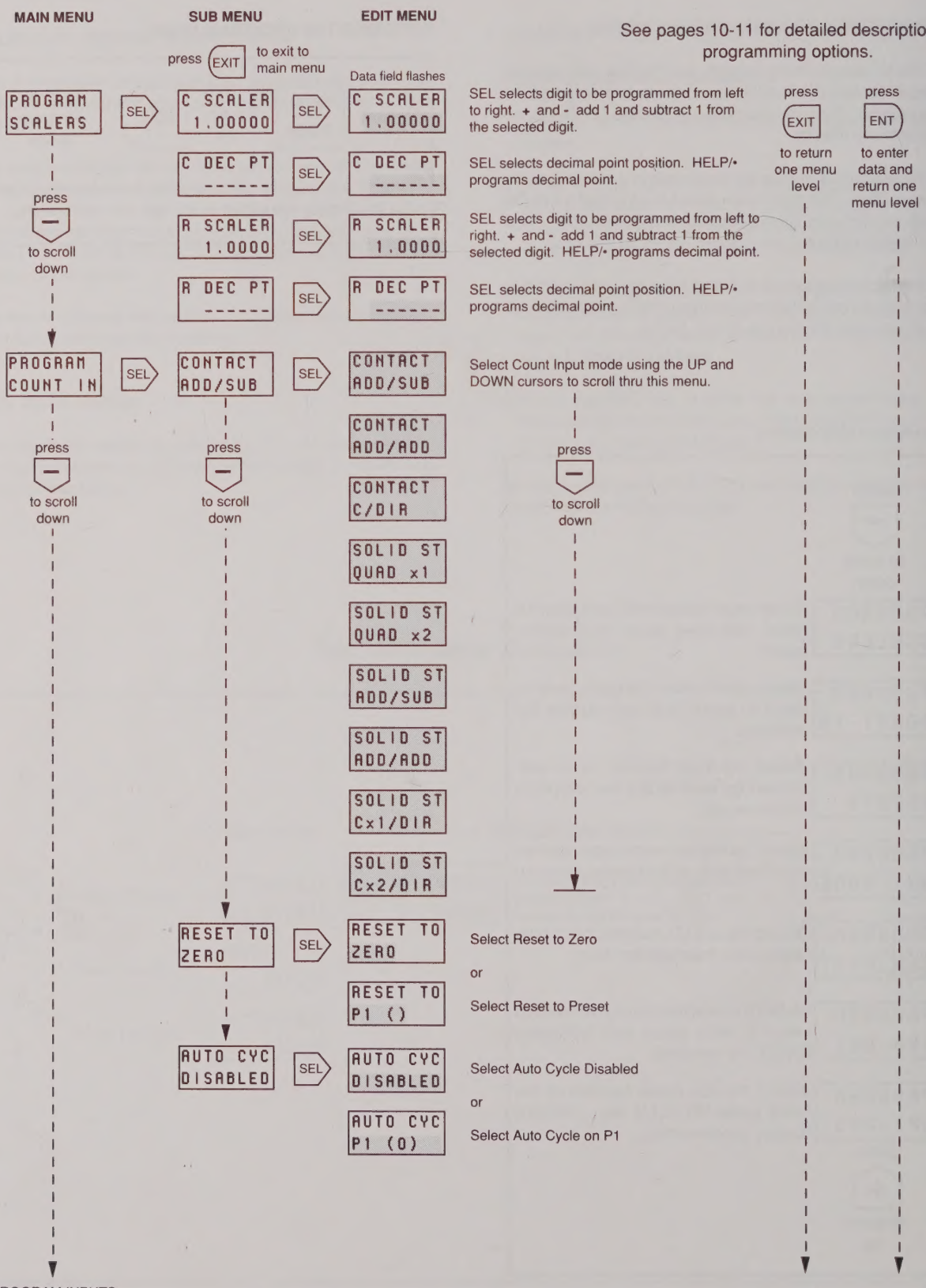
press [+] to scroll up

ENTERING THE PROGRAM MODE

Press **RUN/PGM** Then **ENT** To enter program mode

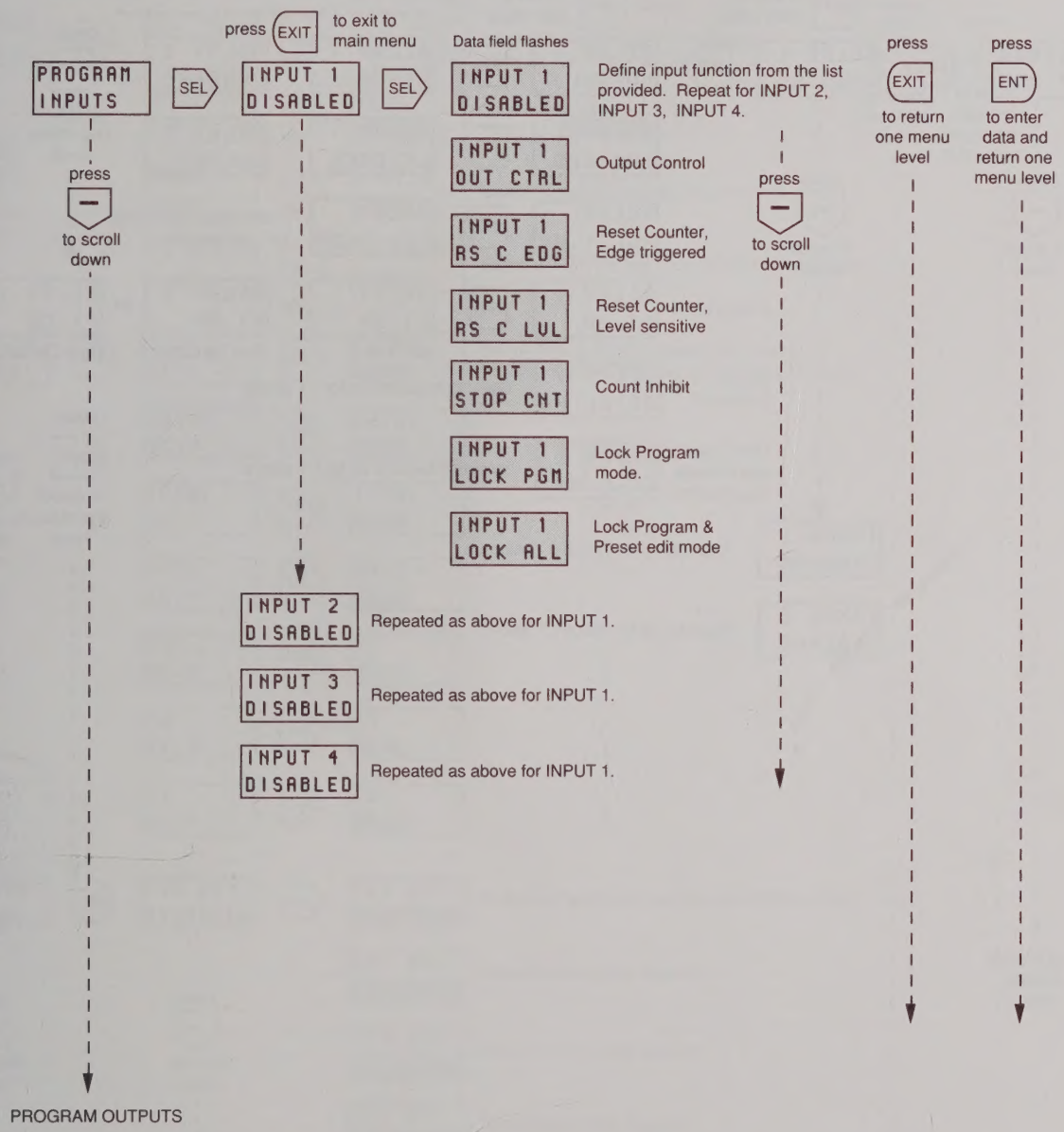
The ENT key must be pressed within five seconds, otherwise the display will return to the last run mode menu.

PROGRAMMING SCALERS AND COUNT INPUTS

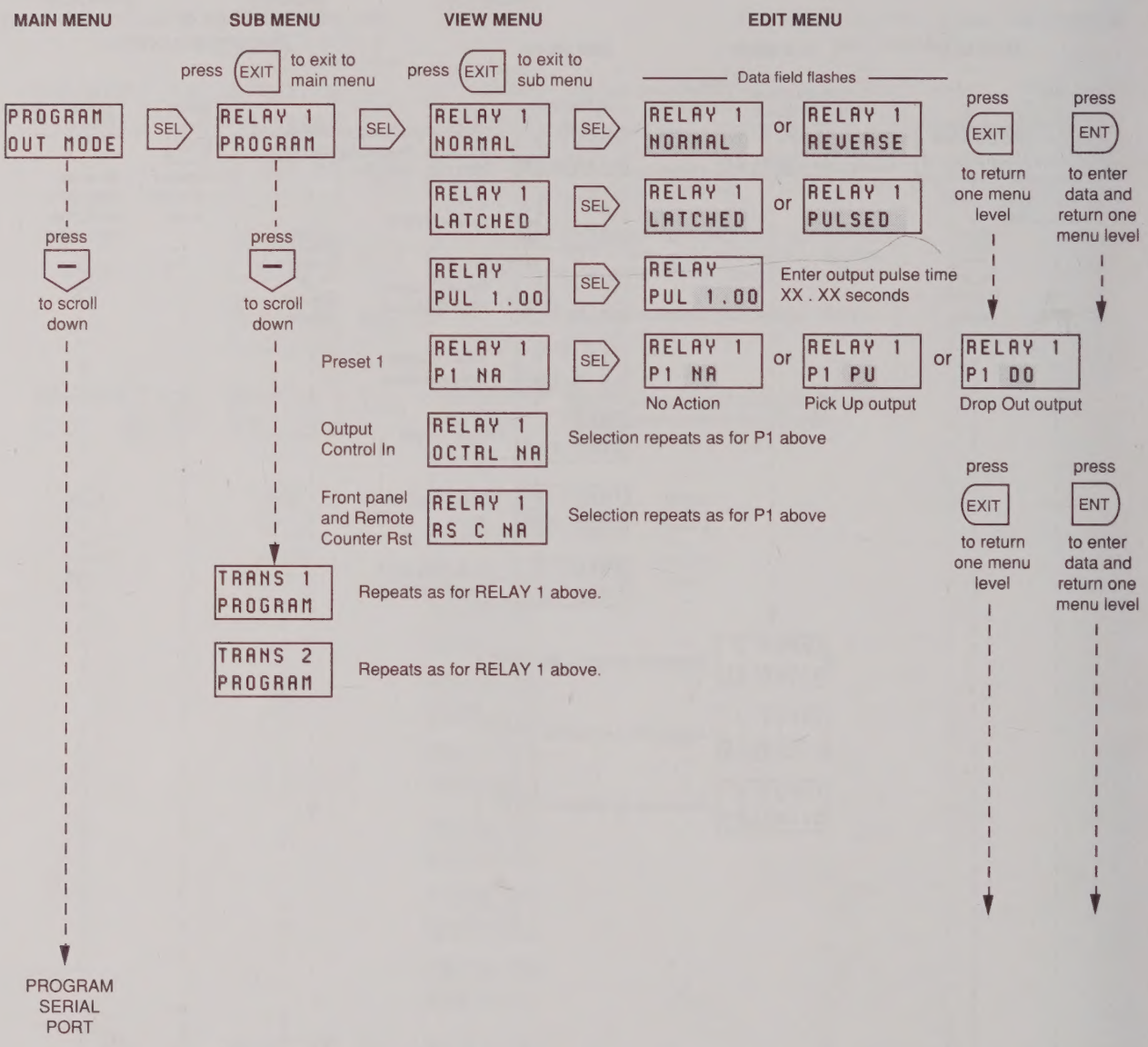

MAIN MENU
SUB MENU
EDIT MENU
See pages 10-11 for detailed description of programming options.
press EXIT to exit to main menu
Data field flashes
PROGRAM SCALERS
SEL
C SCALER 1.00000
C SCALER 1.00000
SEL selects digit to be programmed from left to right. + and - add 1 and subtract 1 from the selected digit.
press EXIT to return one menu level
press ENT to enter data and return one menu level
C DEC PT ------
C DEC PT ------
SEL selects decimal point position. HELP/• programs decimal point.
press — to scroll down
R SCALER 1.0000
R SCALER 1.0000
SEL selects digit to be programmed from left to right. + and - add 1 and subtract 1 from the selected digit. HELP/• programs decimal point.
R DEC PT ------
R DEC PT ------
SEL selects decimal point position. HELP/• programs decimal point.
PROGRAM COUNT IN
CONTACT ADD/SUB
CONTACT ADD/SUB
Select Count Input mode using the UP and DOWN cursors to scroll thru this menu.
CONTACT ADD/ADD
CONTACT C/DIR
SOLID ST QUAD x1
SOLID ST QUAD x2
SOLID ST ADD/SUB
SOLID ST ADD/ADD
SOLID ST Cx1/DIR
SOLID ST Cx2/DIR
RESET TO ZERO
RESET TO ZERO
Select Reset to Zero
or
RESET TO P1 ()
Select Reset to Preset
AUTO CYC DISABLED
AUTO CYC DISABLED
Select Auto Cycle Disabled
or
AUTO CYC P1 (0)
Select Auto Cycle on P1
PROGRAM INPUTS

PROGRAMMING CONTROL INPUTS

See pages 10-11 for detailed description of programming options.

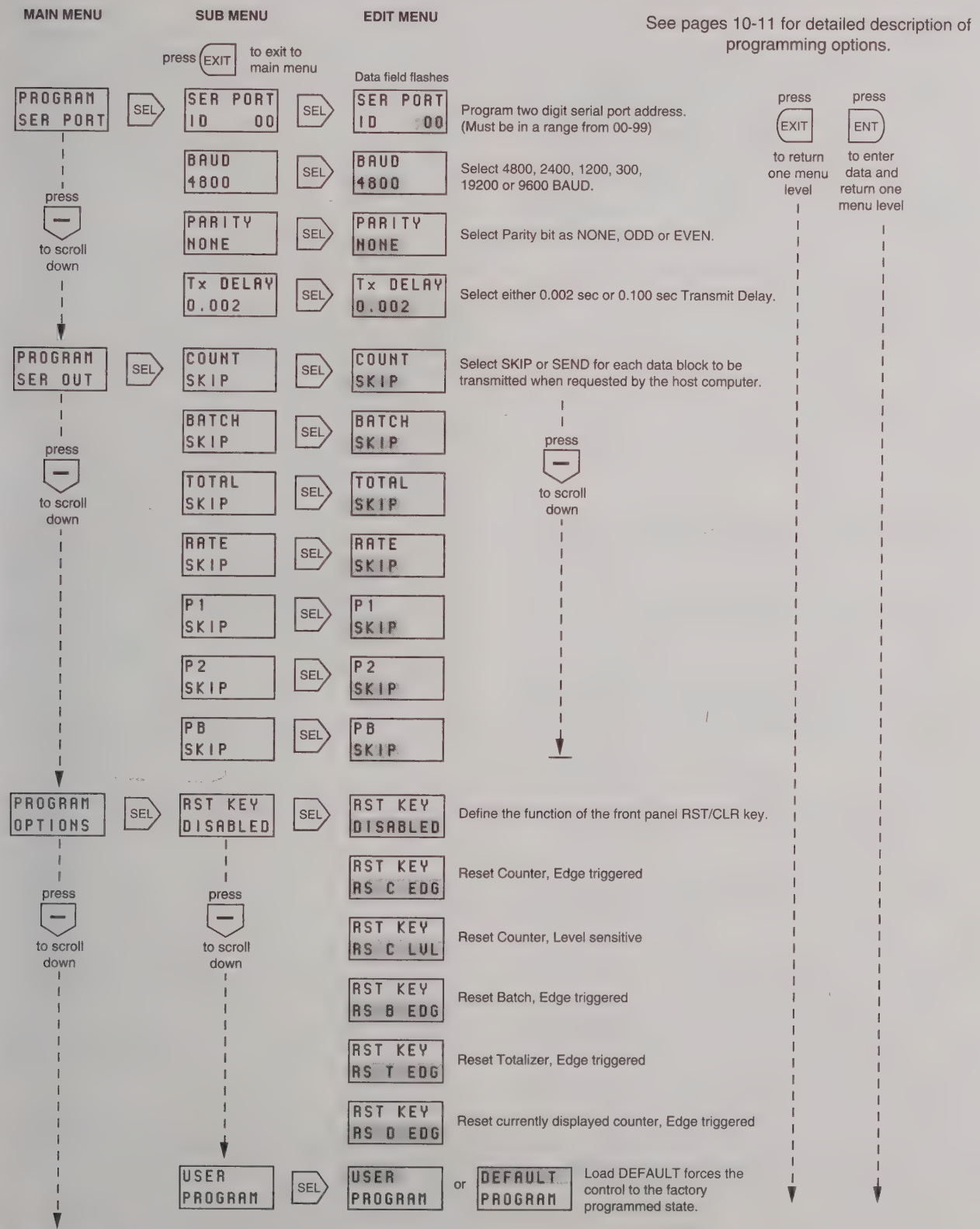

MAIN MENU
SUB MENU
EDIT MENU
press EXIT to exit to main menu
Data field flashes
PROGRAM INPUTS
SEL
INPUT 1 DISABLED
SEL
INPUT 1 DISABLED
Define input function from the list provided. Repeat for INPUT 2, INPUT 3, INPUT 4.
press EXIT to return one menu level
press ENT to enter data and return one menu level
press to scroll down
INPUT 1 OUT CTRL
Output Control
INPUT 1 RS C EDG
Reset Counter, Edge triggered
INPUT 1 RS C LVL
Reset Counter, Level sensitive
INPUT 1 STOP CNT
Count Inhibit
INPUT 1 LOCK PGM
Lock Program mode.
INPUT 1 LOCK ALL
Lock Program & Preset edit mode
press to scroll down
INPUT 2 DISABLED
Repeated as above for INPUT 1.
INPUT 3 DISABLED
Repeated as above for INPUT 1.
INPUT 4 DISABLED
Repeated as above for INPUT 1.
PROGRAM OUTPUTS

PROGRAMMING OUTPUTS



See pages 10-11 for detailed description of programming options.

PROGRAMMING SERIAL PORT AND OPTIONS


MAIN MENU
SUB MENU
EDIT MENU
See pages 10-11 for detailed description of programming options.
press EXIT to exit to main menu
Data field flashes
PROGRAM SER PORT
SEL
SER PORT ID 00
SER PORT ID 00
Program two digit serial port address. (Must be in a range from 00-99)
press EXIT to return one menu level
press ENT to enter data and return one menu level
BAUD 4800
Select 4800, 2400, 1200, 300, 19200 or 9600 BAUD.
press to scroll down
PARITY NONE
Select Parity bit as NONE, ODD or EVEN.
Tx DELAY 0.002
Select either 0.002 sec or 0.100 sec Transmit Delay.
PROGRAM SER OUT
COUNT SKIP
Select SKIP or SEND for each data block to be transmitted when requested by the host computer.
BATCH SKIP
TOTAL SKIP
RATE SKIP
P1 SKIP
P2 SKIP
PB SKIP
PROGRAM OPTIONS
RST KEY DISABLED
Define the function of the front panel RST/CLR key.
RST KEY RS C EDG
Reset Counter, Edge triggered
RST KEY RS C LVL
Reset Counter, Level sensitive
RST KEY RS B EDG
Reset Batch, Edge triggered
RST KEY RS T EDG
Reset Totalizer, Edge triggered
RST KEY RS D EDG
Reset currently displayed counter, Edge triggered
USER PROGRAM
or
DEFAULT PROGRAM
Load DEFAULT forces the control to the factory programmed state.
roll around to PROGRAM SCALERS

SCALERS

C SCALER — the count scaler determines the value of each input pulse. The counter displays whole numbers only. The count scale factor affects the counter but does not affect the rate meter. The count scaler's decimal point position is fixed.

C DEC PT — sets the decimal point position for the counter. The decimal point position and scale factor value are independent.

R SCALER — the rate scaler is used to adjust the rate meter reading and compensate for the number of input pulses per item. The rate scaler's decimal point is programmable. The rate scaler and count scaler are independent.

R DEC PT — sets the decimal point position for the rate display. The rate decimal point position and scale factor value are independent.

COUNT INput

CONTACT ADD/SUB — input A adds counts and input B subtracts counts. This mode includes input filtering to debounce mechanical contacts.

CONTACT ADD/ADD — inputs A and B both add counts. This mode includes input filtering to debounce mechanical contacts.

CONTACT C/DIR — count with direction control. Input A adds counts when the B input is high. Input A subtracts counts when the B input is low.

SOLID ST QUAD x1 — requires a quadrature signal input. This mode provides direction control and is used to eliminate false counts due to jitter or vibration. The count direction depends on the phase relationship of inputs A and B.

SOLID ST QUAD x2 — same as the quadrature x1 mode above except that counts occur on both edges of input signal. This allows increased resolution from the same pulse source.

SOLID ST ADD/SUB — same as the contact add/subtract mode but can be used with high speed count signals.

SOLID ST ADD/ADD — same as the contact add/add mode but can be used with high speed count signals.

SOLID ST C x1/DIR — same as contact count/direction but can be used with high speed count signals.

SOLID ST C x2/DIR — same as above except counts occur on both edges of input signal for increased resolution.

RESET TO ZERO — the counter resets to zero when a counter reset occurs. The normal count direction is up and the counter outputs respond only when counting up.

RESET TO P1 ( ) — the counter resets to the preset value when a counter reset occurs. Preset coincidence occurs when the counter reaches zero. The normal count direction is down and the counter preset output responds only when counting down.

AUTO CYC DISABLED — the counter does not automatically reset when it reaches the preset value.

AUTO CYC P1(0) — the counter automatically resets as programmed when it reaches the preset coincidence value. The preset coincidence value is zero when in the reset to preset mode.

INPUTS

INPUT 1 DISABLED — input 1 does not perform any function when turned on.

INPUT 1 OUT CTRL — when input 1 is turned on, an output control signal occurs (edge sensitive). While more than one input may be programmed for output control, only one output control channel is available in the unit.

INPUT 1 RS C EDG — the counter resets when input 1 is turned on (edge sensitive). If input 1 remains on, the counter can still count.

INPUT 1 RS C LVL — the counter is held at the reset value while input 1 is on (level sensitive).

INPUT 1 STOP CNT — all count functions stop (inhibited) while input 1 is on (level sensitive).

INPUT 1 LOCK PGM — all program editing is disabled (keyboard and serial) while input 1 is on (level sensitive). Preset values can still be changed serially or from the keyboard.

INPUT 1 LOCK ALL — all programming and preset editing functions (keyboard and serial) are disabled while input 1 is on (level sensitive). The user can still select different run mode displays from the keyboard.

Each of the above functions are repeated for inputs 2, 3, and 4 respectively.

DESCRIPTION OF PROGRAM OPTIONS

OUTput MODE

RELAY 1 NORMAL — relay 1 turns on when it receives a pick-up signal and turns off when it receives a drop-out signal.

RELAY 1 REVERSE — relay 1 turns on when it receives a drop-out signal and turns off when it receives a pick-up signal. The relay always powers-up in the off state.

RELAY 1 LATCHED — relay 1 turns on (off if reversed) when it receives a pick-up signal and stays on (off if reversed) until it receives a drop-out signal.

RELAY 1 PULSED — relay 1 turns on (off if reversed) when it receives a pick-up signal and automatically turns off (on if reversed) after the time specified below.

RELAY 1 PUL — enter the desired time for relay 1 to stay on (00.01 to 99.99 seconds). This screen is not displayed unless pulsed is selected in the menu above.

RELAY 1 P1 — relay 1 can be programmed for no action, pick-up or drop-out when the main counter reaches the preset.

RELAY 1 OCTRL — relay 1 can be programmed for no action, pick-up or drop-out when an output control signal occurs. One of the inputs must be programmed for output control before a RELAY 1 OCTRL can occur.

RELAY 1 RS C — relay 1 can be programmed for no action, pick-up or drop-out when a reset counter signal occurs. The reset key or one of the inputs must be programmed to reset the main counter before a RELAY 1 RS C can occur.

Each of these functions is repeated for transistor output 1 and transistor output 2 sub-menus.

SERial PORT

SER PORT ID — enter the desired two digit serial ID number (00-99 decimal). All communications to the control must contain this number (in hexadecimal). Each unit must have a unique ID#.

BAUD — selects the serial port transmit and receive baud rate. Allowable rates are 19200*, 9600*, 4800, 2400, 1200, and 300.

*Version 5 firmware or later. To check firmware version, press Help key twice from run mode. First two digits (top left) should read "25" or greater for version 5 or later.

PARITY — the user may select none, odd, or even parity. If none (no parity) is selected, the counter transmits space parity and does not check received parity.

Tx DELAY — The user may select a transmission delay of either 2 or 100 milliseconds. The counter waits for this time period before responding to any serial commands. This delay is provided to allow a host computer time to switch from the transmit to receive mode.

SERial OUT

These options determine which items are sent when the counter receives the RCD7 command.

OPTIONS

RST KEY DISABLED — the RST/CLR key does not perform any function.

RST KEY RS C EDG — the counter resets when the RST/KEY is pressed (edge sensitive). If the RST/KEY is held on, the counter can still count.

RST KEY RS C LVL — the counter is held at the reset value while the RST/KEY is pressed (level sensitive).

USER/DEFAULT PROGRAM — If the user selects default, the counter returns all program mode options to the factory set values (first choice shown in menus). Counter and preset values are not affected. This screen shows USER PROGRAM if any options have been changed from the default settings.

CALCULATING SCALE FACTORS

COUNT SCALING

The count scaler is a user programmable number which determines the count value of each input pulse. It is used to correct for a known amount of error (wheel wear, viscosity, etc.) or to convert the incoming count signal into the desired units of measure on the display (feet, gallons, yards, etc.). The main counter and totalizer show whole (integer) counts; the scaler retains fractional counts.

Count Scaler Range: 0.00001 to 9.99999

Default Count Scaler: 1.00000

Count Scaler (CS) Formula:

$$CS = \frac{DPF}{PPI}$$

where:

DPF is the decimal point factor determined by the desired decimal point position on the main counter and totalizer display:

DISPLAY	DPF	DISPLAY	DPF
XXXXXX	= 1	XXX.XXX	= 1,000
XXXXX.X	= 10	XX.XXXX	= 10,000
XXXX.XX	= 100	X.XXXXX	= 100,000

(Use the counter decimal point menu to select the desired decimal point position for the main counter and totalizer.)

PPI is the number of pulses per item from the sensor (times 2 if doubled count mode).

Example 1: A sensor produces 20 pulses per inch of material travel. Calculate the count scaler required to indicate material used in whole inches (XXXXXX).

$$CS = \frac{1}{20} = 0.05000$$

Example 2: An encoder produces 120 pulses per foot. Calculate the count scaler required to indicate material usage in 1/100's of feet (XXXX.XX).

$$CS = \frac{100}{120} = 0.83333$$

(Select the XXXX.XX position on the counter decimal point menu).

RATE SCALING

The 1/Tau rate meter calculates rate by measuring the time interval between input pulses, converting to frequency, and multiplying by the rate scaler. The rate scaler is user programmed to convert the count input pulse frequency into the desired units for display (feet/minute, inches/second, boxes/hour, etc.).

Rate Scaler Range: 0.00001 to 99999

Default Rate Scaler: 1.0000

Rate Scaler (RS) formula:

$$RS = \frac{SEC \times DPF}{PPI}$$

where:

SEC is the number of seconds in the rate time unit (items/minute = 60, items/hour = 3600, etc.).

DPF is the decimal point factor determined by the desired decimal point position on the rate meter display:

DISPLAY	DPF	DISPLAY	DPF
XXXXXX	= 1	XXX.XXX	= 1,000
XXXXX.X	= 10	XX.XXXX	= 10,000
XXXX.XX	= 100	X.XXXXX	= 100,000

(Use the rate decimal point menu to select the desired decimal point position for the rate meter.)

PPI is the number of pulses per item from the sensor (times 2 if doubled count mode).

Example 1: A sensor produces 1 pulse per foot of material travel. Display rate in whole feet per minute (XXXXX).

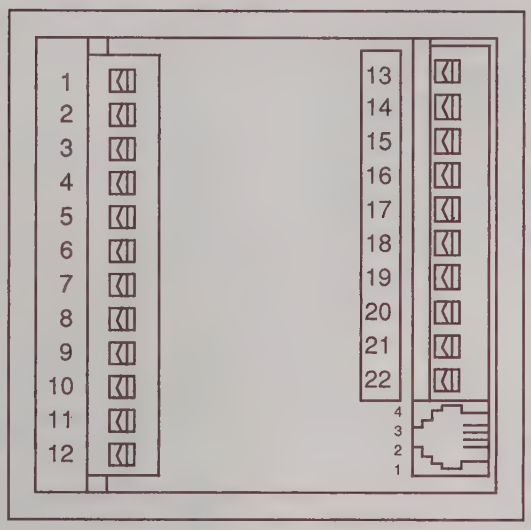
$$RS = \frac{60 \times 1}{1} = 60.000$$

Example 2: A flow sensor produces 400 pulses per gallon. Display flow rate in tenths of a gallon per minute (XXXX.X).

$$RS = \frac{60 \times 10}{400} = 1.5000$$

(Select the XXXXX.X position on the rate decimal point menu.)

REAR TERMINAL DESCRIPTION



TERMINAL DESCRIPTIONS

1 - On models 57601 and 57602 this terminal is the +12 VDC power output. It is used to supply 12 VDC (+/- 25% 100 mA max) for accessories. DC Common is the negative side of this supply.

On the model 57600 this terminal is used for the 10-15 VDC power input. Connect the positive lead of the power supply to terminal 1 and the negative lead to DC Common.

2, 3 and 4 - DC Common: These terminals are connected to the negative side of the counter's internal DC power supply. Count inputs must be referenced to DC Common. Control inputs are on when connected to DC Common. Transistor outputs conduct to DC Common when picked up. For maximum noise immunity, the ground terminal must be connected to a good earth ground. All shielded signal cables should be connected to earth ground or ground on the counter.

5, 6 and 7 - Not used

8, 9 and 10 - Relay 1 contacts: The relay output consists of one electrically isolated form C set of contacts. The user must supply power through a contact to the external load. The contacts remain in the normal state until a pick-up signal occurs. The relay remains picked up (on) until a drop out signal occurs (see output programming diagram page 8 and block diagram page 2).

11 and 12 - AC Power Inputs:

Model 57601-401	115VAC
Model 57602-401	230VAC
Model 57600-401	Not used

13, 14 - Transistor Outputs 2 and 1: These terminals are separate open collector NPN transistor outputs. Each output conducts to DC Common when picked up (see output programming diagram page 8 and block diagram page 2).

15, 16, 17, and 18 - Inputs 1, 2, 3, and 4: Programmable inputs. The user can assign one of six functions to each individual input. The inputs require a current sinking signal (contact or solid state) to DC Common (see input programming diagram page 7 and block diagram page 2).

19, 20 - Count Inputs B and A: Connect the count input signal(s) to these terminals. The count input can operate with either a current sinking signal (contact or solid state) to DC Common or a current sourcing signal. (See specifications, programming diagram page 6, and block diagram page 2.) Rate calculations are made from count pulses into Input A only.

21, 22 - RS-485 serial I/O port: Connect terminal 21 to the positive lead of the communications bus. Connect terminal 22 to the negative lead of the communications bus.

MODULAR COMMUNICATION JACK

The modular phone jack is an alternate connection to the RS-485 communications port. Pin 2 is positive and is the same as terminal 21. Pin 3 is negative and is the same as terminal 22. Pins 1 and 4 are connected to DC Common and should be used for any shield connections.

Note: This jack is intended only for connection to Ambassador and other RS-485 communication networks. **It should not be connected to any telephone system - damage or hazard may result.**

TERMINAL BLOCKS

Connections to the Ambassador are made through deplugable, screw terminal blocks to allow for ease of wiring and removal of the counter. The terminals can accommodate stranded, solid or fused wire (preferred) from 14 to 22 gauge.

To remove the terminal block, remove AC power and pry gently underneath each end of the terminal block with small screwdriver. Press straight on to re-install.

GENERAL WIRING PRACTICES

1. Disconnect all power before wiring terminals. **A safety hazard exists if this precaution is not observed. Treat all control and count inputs as hazardous since they may carry line voltage**.

2. Use shielded cables for count signals, control input and communications signals. Connect shield to common (terminal 2, 3 or 4) of counter to terminate properly.

3. Keep all signal lines as short as possible.

4. Do NOT bundle or route signal lines with power or machine control wiring. Use separate conduit for power and signal wires.

5. Provide "clean" power to the counter. In severe cases, power may have to be filtered or a separate power source used. Do not use same power source that is supplying the loads.

DIP SWITCH FUNCTIONS

Switch 1: Input A sink/source
- Off: input A requires a current sinking input signal.
- On: input A requires a current sourcing input signal.

Switch 2: Input B sink/source
- Off: input B requires a current sinking input signal.
- On: input B requires a current sourcing input signal.

Switch 3: Input A threshold level
- Off: high threshold level — use with DC sensors.
- On: low threshold level — use with mag pickups. Turn switch 1 on.

Switch 4: Input B threshold level
- Off: high threshold level — use with dc sensors.
- On: low threshold level — use with mag pickups. Turn switch 2 on.

Dip switches may be set through an opening on the bottom of the unit. It is located towards the rear of the control.

PANEL MOUNTING

The panel mounting kit includes:
(1) mounting gasket, (2) mounting clips and (4) screws.

Refer to the dimension diagram on page 28 for a drawing of the correct installation of these parts.

The mounting gasket is coated on one side with a contact adhesive and a paper backing. Care should be taken during the gasket installation that the gasket be correctly positioned on the panel at the first attempt. Attempting to re-position the gasket once the adhesive has come in contact with the panel is likely to deform or tear the gasket. This may result in an improper seal. For best results, follow these directions:

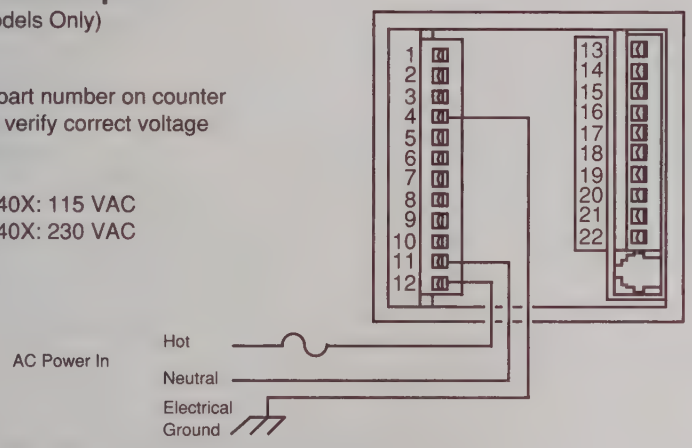
1. Stand the Ambassador counter on a desk or table with its display down, screw terminals up.
2. Remove and discard the center square of the gasket at the scribe marks in the gasket and paper backing. Do not remove the backing from the remaining outer rim.
3. Slide the gasket down the unit until it is in position at the rear of the unit's front bezel. The paper backing side should be up.
4. Insert the tip of a knife between the paper and the gasket and, while holding the gasket down to the unit with the knife, peel off the paper backing.
5. Slide the unit through the panel cutout until the gasket firmly adheres to the panel.
6. Install the mounting clips and screws as shown in the diagram 28. Do not overtighten the mounting screws. The screws should be tight enough to firmly hold the unit in place, but not so tight as to squeeze the gasket out from behind the front bezel.

AC Power Input

(AC Models Only)

Check part number on counter label to verify correct voltage rating.

57601-40X: 115 VAC
57602-40X: 230 VAC



Terminal 4 (Ground) and terminals 2 and 3 (Com) are internally connected.

AC Power In	Fuse Size
120 V, 60 Hz	1/8 amp
120 V, 50 Hz	1/4 amp
240 V, 60 Hz	1/16 amp
240 V, 50 Hz	1/8 amp

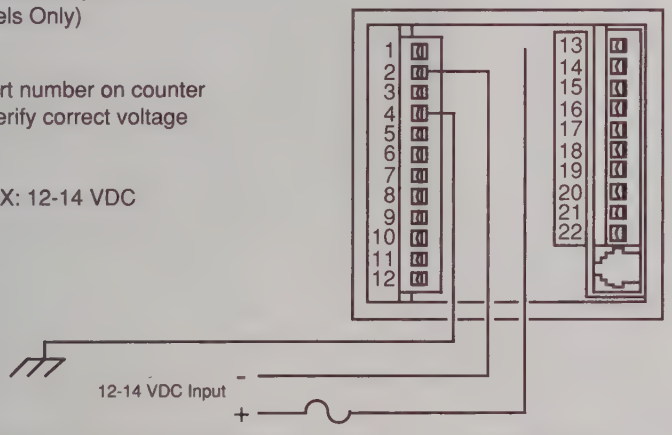
Use slow blow fuses for all voltages.

DC Power Input

(DC Models Only)

Check part number on counter label to verify correct voltage rating.

57600-40X: 12-14 VDC



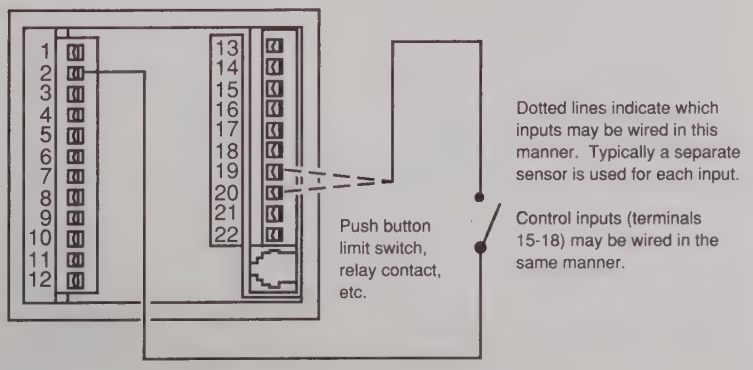
Terminal 4 (Ground) and terminals 2 and 3 (Com) are internally connected.

Use 1/2 amp slow blow fuse. (Does not include external transducer load.)

Contact Count Input

To prevent multiple counts, use one of the contact count modes. See programming diagram.

All dip switches OFF.

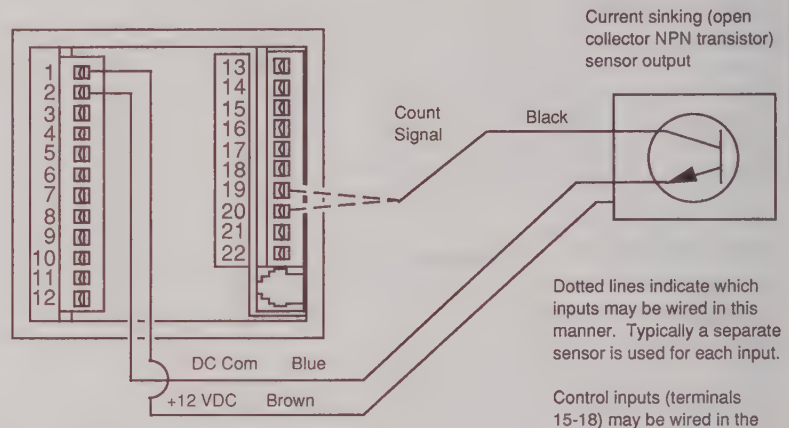


Current Sinking Sensor Count Input

Do not connect Term 1 if sensor is powered from another power supply.

Wire colors shown correspond to Durant inductive proximity and photo sensors.

All dip switches OFF.

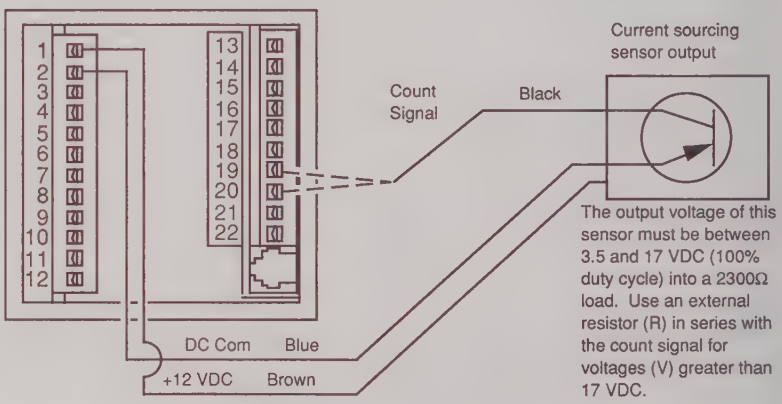

Current sinking (open collector NPN transistor) sensor output
Count Signal
Black
1 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16 17 18 19 20 21 22
DC Com
Blue
+12 VDC
Brown
Dotted lines indicate which inputs may be wired in this manner. Typically a separate sensor is used for each input.
Control inputs (terminals 15-18) may be wired in the same manner.

Current Sourcing Sensor Count Input

Do not connect Term 1 if sensor is powered from another power supply.

Wire colors shown correspond to Durant inductive proximity and photo sensors.

Dip switches 1 and/or 2 ON to select current source mode, switches 3 and 4 OFF.

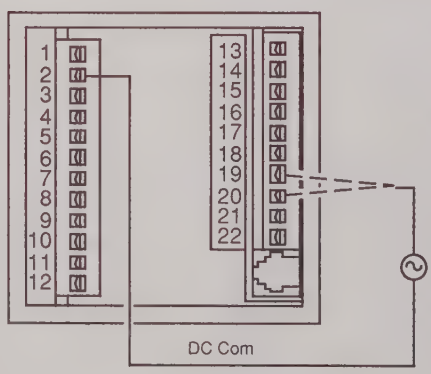

Current sourcing sensor output
Count Signal
Black
1 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16 17 18 19 20 21 22
DC Com
Blue
+12 VDC
Brown
The output voltage of this sensor must be between 3.5 and 17 VDC (100% duty cycle) into a 2300Ω load. Use an external resistor (R) in series with the count signal for voltages (V) greater than 17 VDC.
R = (V x 230) - 2300

AC Signal Count Input

17 VAC RMS 48 V Peak-to-Peak maximum into 2.3 KΩ load impedance. Use an external resistor (R) in series with the count input signal for input voltages (V) greater than 17 VAC.

R = (V x 230) - 2300

Dip switches 3 and/or 4 ON (AC mode).
Dip switches 1 and 2 ON.



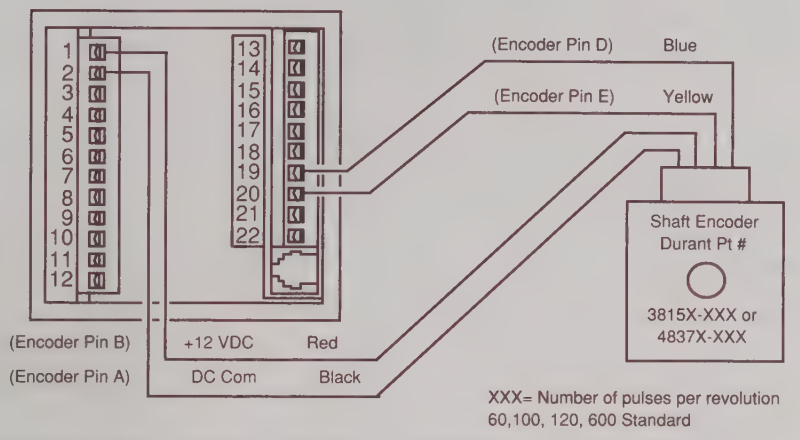
Caution:
The unit requires 1.2 V P-to-P minimum signal amplitude to count. Magnetic pickups produce an output voltage directly proportional to the speed of the ferrous material passing the pickup. At low speeds, or at starting or stopping, the output voltage from the pickup may not be great enough to cause the counter to count. For magnetic pickup signals in the range of 50 mV to 400 V P-to-P, a signal conditioner (Durant part no. 48160-400) is recommended.

Shaft Encoder Wiring

Do not connect Term 1 if sensor is powered from another power supply.

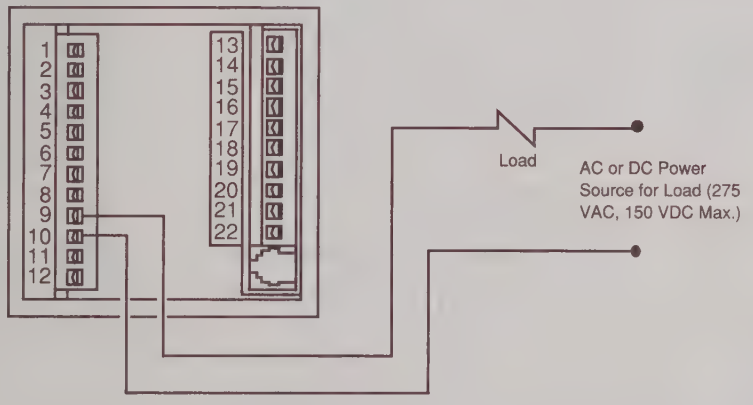
Wire colors shown are for quadrature encoder, do not connect the yellow wire for a single channel encoder.

All dip switches OFF.



Relay Contact Output Wiring

This wiring example shows the load being controlled from the normally open contacts of Relay 1. Wiring for the normally closed contacts (8,9) would be done in the same manner. Wiring for the Relay 2 contacts (5,6,7) is also done in the same manner.

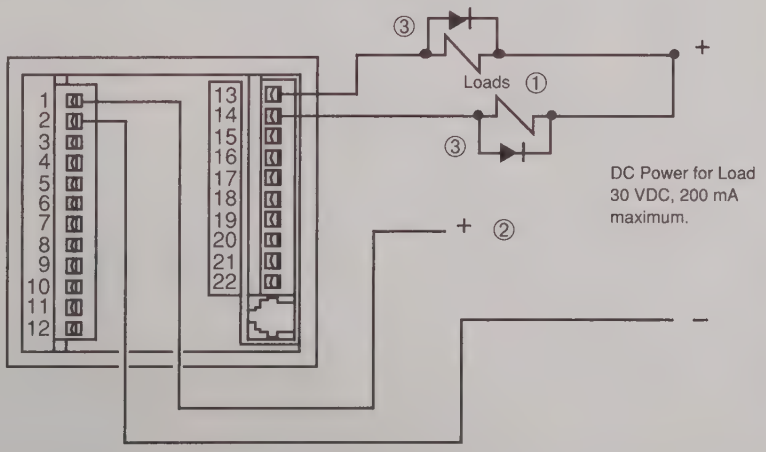


Wiring DC Loads to Transistor Outputs

① The load must not draw more than 200 mA of current.

② The counter's internal DC supply can be used to power DC loads. The total current drawn from terminal 1 cannot exceed 100 mA.

③ Use external diode suppression in parallel with inductive loads.



INTRODUCTION TO SERIAL COMMUNICATIONS

The advanced communication capability of the Ambassador control allows a host computer to read and reset the counter, read and write the preset, inhibit and enable counts, turn outputs on and off, lock and unlock the keyboard, and read and program all setup parameters.

The Control uses ASCII code with the RS-485 serial specification and Opto-22 compatible protocol. This allows bi-directional communications and addressing of multiple controls on a single two-wire communication bus. Each unit is individually addressed via a user programmable ID number. Up to 100 counters can be connected directly to the bus. Interconnect kits and bulk RS-485 communication cable are available; see accessory parts list.

Serial Command Summary

ESP: Enter Serial programming
LAL: Lock All
LPG: Lock Program
OCL: Output Control
RCD: Read Counter Data
RDV: Read Device Value
RPI: Read Program Item
RSC: Reset Counter
STP: Stop Count
WP1: Write Preset 1
WPI: Write Program Item
UAL: Unlock All
UPG: Unlock Program
XSP: Exit Serial Programming

SERIAL COMMAND FORMAT

The general command format is shown below. Spaces are used for clarity only and must not be transmitted.

> ID# COMMAND [numeric data] CHECKSUM (cr)

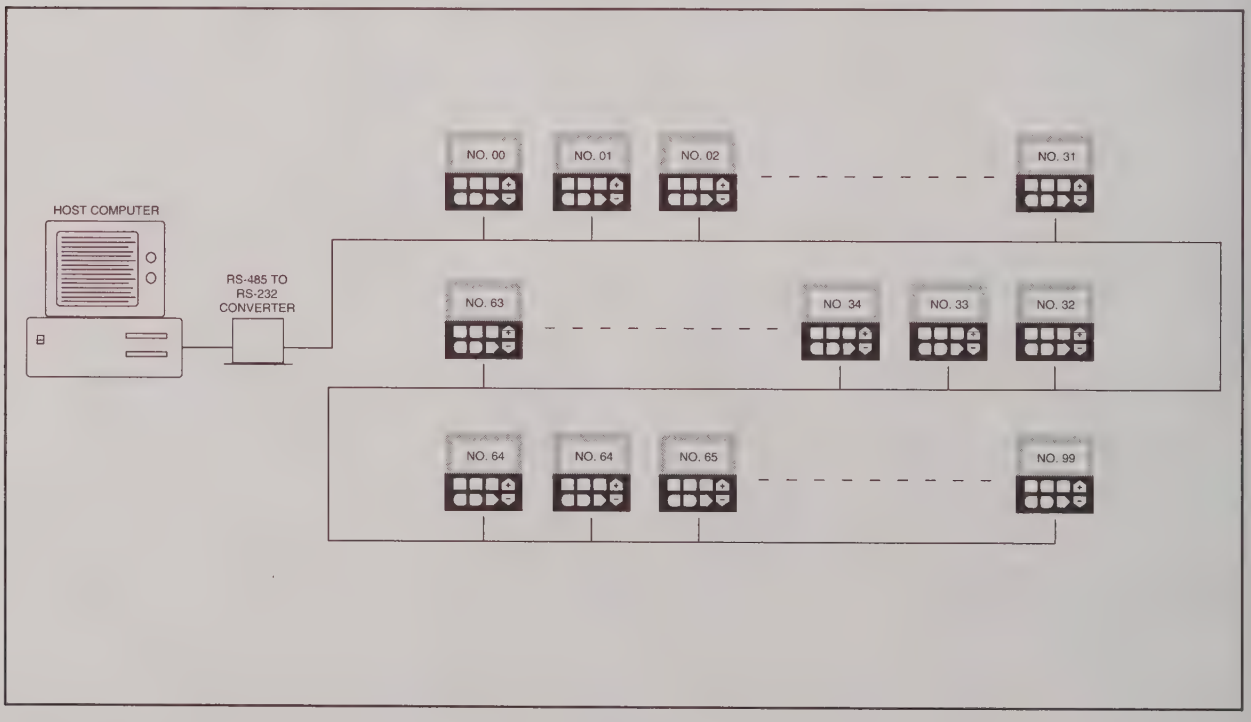
Example:

To cause unit# 10 to transmit the value of the counter, send the RCD command as follows:

>	0A	RCD	2	7C	(CR)
1	2	3	4	5	6

1. Message start character (ASCII 62). Required for all transmissions to the control.
2. Two digit serial port ID# in hexadecimal. Required for all transmissions to the control. Unit ID# 10 (decimal) is unit ID# 0A (hexadecimal). Capital letters must be used.
3. RCD (Read Counter Data) command. All serial commands consist of three characters. Letters may be upper or lower case. (see pages 19 - 21 for description of all commands).

Example Ambassador Serial Communication Network



4. Numeric data required with the RCD command to specify counter or preset to be read. Up to eight numeric characters are required for some commands. Most commands do not require any numeric characters (see pages 19 through 21 for list of all commands).

5. Two digit hexadecimal checksum of the ASCII values of the ID number, command, and any required numeric characters. Required for all transmissions to the control.

   Checksum Calculation:

0	A	R	C	D	2

   48 + 65 + 82 + 67 + 68 + 50 = 380 (dec.)

   The checksum is the last two hexadecimal characters — 7A. Upper or lower case letters may be used. The > start character and carriage return are not used in calculation.

6. ASCII carriage return (13 decimal). Required at the end of all commands.

SERIAL RESPONSE FORMAT

The counter does not respond to a command unless the transmitted ID number matches its programmed ID number.

If the ID numbers match and the command and checksum are valid, the control executes the command and transmits a response as shown below:

A [data] [checksum] (cr) where:

A is the acknowledge character (ASCII 65) sent when any valid command is received and executed.

[data] is sent in response to the RCD, RDV, or RPI commands which request data. Data is not transmitted for other commands.

[checksum] is sent only when data is requested (RCD, RDV or RPI commands). The checksum is calculated by adding the ASCII values of all preceding characters (including the spaces, but not including the acknowledge character "A"). The checksum is the two least significant digits of this sum in hexadecimal.

(cr) is the ASCII carriage return (13 decimal). Transmitted at the end of all responses.

EXAMPLES:

A(cr)	No data requested
ACT 337914 52(cr)	Count data requested

If the ID numbers match but the command is not valid or cannot be executed, the counter ignores the command and responds by sending an ASCII "N" (not acknowledged) followed by a one character error code and a carriage return.

Error Codes:

00 - Power up Error — When power is applied to the unit, or the program mode is exited, the unit performs a pwoer up self test. The first valid command received by the unit following the self test is not executed and not acknowledged.
10 - Lock input is on — cannot change preset values or enter serial program mode until lock input is removed.
02 - Checksum error — received checksum does not match calculated checksum.
01 - Command not found in table or invalid command — WPI, RPI, XSP received when not in serial program mode.
05 - Invalid data — incorrect number of digits or illegal character received in data field.
11 - Preset edit in progress on keyboard — serial preset cannot be sent if preset is being changed on the keyboard.
12 - Command is valid for this family but not this counter or command is not valid with this program configuration — cannot change output time if output is set to latch.
13 - Keyboard programming mode is active — cannot enter serial program mode if in keyboard program mode.

EXAMPLES: N05(cr) Invalid data
N10(cr) Lock input is on

SERIAL RUN-MODE COMMANDS

RCD(n) — Read Counter Data

This command must be followed by a number (n) from 0 to 7. The number determines which value the counter sends. The requested value is preceded by a two character counter or preset abbreviation. The counter formats its response in a 12 character field. The counter sends any programmed decimal points in the correct location. Leading zeros are sent as spaces.

EXAMPLE COMMAND: >1BRCD37F(cr) Reads rate indicator from unit 27.

EXAMPLE RESPONSES:

(n)	Value Sent	Response Formats with Different Decimal Points	
0	Counter	ACT	123456 4C(cr)
3	Rate	ART	123456 5B(cr)
4	Preset 1	AP1	123456 36(cr)

0	Counter	ACT	123.456 5A(cr)
3	Rate	ART	123.456 69(cr)
4	Preset 1	AP1	123.456 44(cr)

RCD7 is a special command that sends all of the values that have been specified in the SERIAL OUTPUT menu. The counter sends values in the order shown above. If the counter is programmed to send the count and preset values, the response might look like this:

ACT 123.456 P1 123.456 9E(cr)

WP1(nnnnnn) — Write Preset 1

The write preset commands allow a host computer to enter a new preset value. The command must be followed by a 6 digit number (000000 to 999999). All leading zeros must be supplied. As with keyboard entry, decimal points cannot be sent to the counter. The counter always displays any decimal point in the programmed position.

EXAMPLE: >10WP10005005E(cr) Sets the preset to a value of 500 on unit 16.

RSC -- Reset Counter

The serial reset command works the same as the reset key (edge) and reset input (edge) functions. Any outputs which are programmed to pick-up or drop-out with a counter reset signal will also respond to the RSC command.

EXAMPLE: >00RSC48(cr) Resets the counter on unit 00.

LAL — Lock All
LPG — Lock Program
UAL — Unlock All
UPG — Unlock Program

The lock and unlock commands allow a host computer to lock or unlock keyboard programming. The commands are similar to a lock input function except serial write and programming commands (WP1 and ESP) are still allowed.

The counter does not store lock commands when power is removed. The host must re-issue the desired lock command after power is re-applied.

Lock inputs are not affected by serial lock commands. If both a lock input and a serial lock command are in effect, the user must remove both locks before programming from the keyboard. The user only needs to remove the lock input for serial programming.

EXAMPLE: >5AUPG62(cr) Cancels a previously issued Lock Program command to unit 90.

STP — Stop Count
RSM — Resume Count

These commands mimic the stop count input function. When the counter receives an STP command, all count input pulses are ignored until the counter receives an RSM command.

The counter does not store the serial stop command when power is removed. The unit will count input pulses when power is re-applied.

EXAMPLE: >00STP57(cr) Inhibit counts on unit 00
>00RSM52(cr) Resume counting on unit 00

OCL — Output Control

Any outputs programmed to pick-up or drop-out with an output control signal will respond. This command is a one-shot or edge command. It is the same as turning on an input that has been programmed for output control.

EXAMPLE: >01OCL3F(cr) Sends an output control signal to unit 01.

RDV — Read Device Value

This command causes the counter to respond with the product family number, the software version number, the hardware configuration byte, and the serial ID number.

EXAMPLE COMMAND: >00RDV4C(cr) Sends RDV command to unit 00.

For this counter the family number is "1", the software version is "1", and the hardware configuration byte is "51". If the serial ID is set to 00 (00 hexadecimal), the response to the RDV command will be:

EXAMPLE RESPONSE: A11510028(cr)

SERIAL PROGRAM-MODE COMMANDS

ESP — Enter Serial Programming

This command causes the counter to enter the serial programming mode. The host must send this command before the unit will respond to serial programming commands (WPI, RPI, and XSP). The counter displays the message "LOADING PROGRAM" when it receives a valid ESP command. The counter and preset values are saved and the outputs dropout as when entering the keyboard programming mode.

If the counter is in the serial programming mode and power is removed, it will enter the keyboard programming mode when power is re-applied.

EXAMPLE: >00ESP48(cr) Causes unit 00 to enter the serial programming mode.

XSP — Exit Serial Programming

This command causes the counter to store any new program data and exit the serial programming mode. It is similar to exiting the keyboard programming mode.

EXAMPLE: >00XSP5B(cr) Causes unit 00 to exit serial programming.

WPI(nnn - nnnnnnnn) — Write Program Item

This command allows a host computer to remotely program an Ambassador unit. The unit must be in the serial programming mode (ESP command). The host must send the WPI command followed by the two to four digit edit menu number of the desired function. A one to six digit data value is required with some edit menus (see diagram on pages 22 and 23 for edit menu item numbers).

EXAMPLE: >00WPI02360000DB(cr) Sets the rate scaler to 60.000 on unit 00.

RPI(nn - nnn) — Read Program Item

This command allows a host computer to determine the programming of an Ambassador unit. The unit must be in the serial programming mode (ESP command). The host must send the RPI command followed by a two or three digit number representing the desired sub-menu (see diagram on pages 22 and 23 for sub-menu numbers). The counter responds by transmitting a number representing the current option selected for a sub-menu.

EXAMPLE COMMAND: >00RPI20AD(cr) Read input 1 selection.

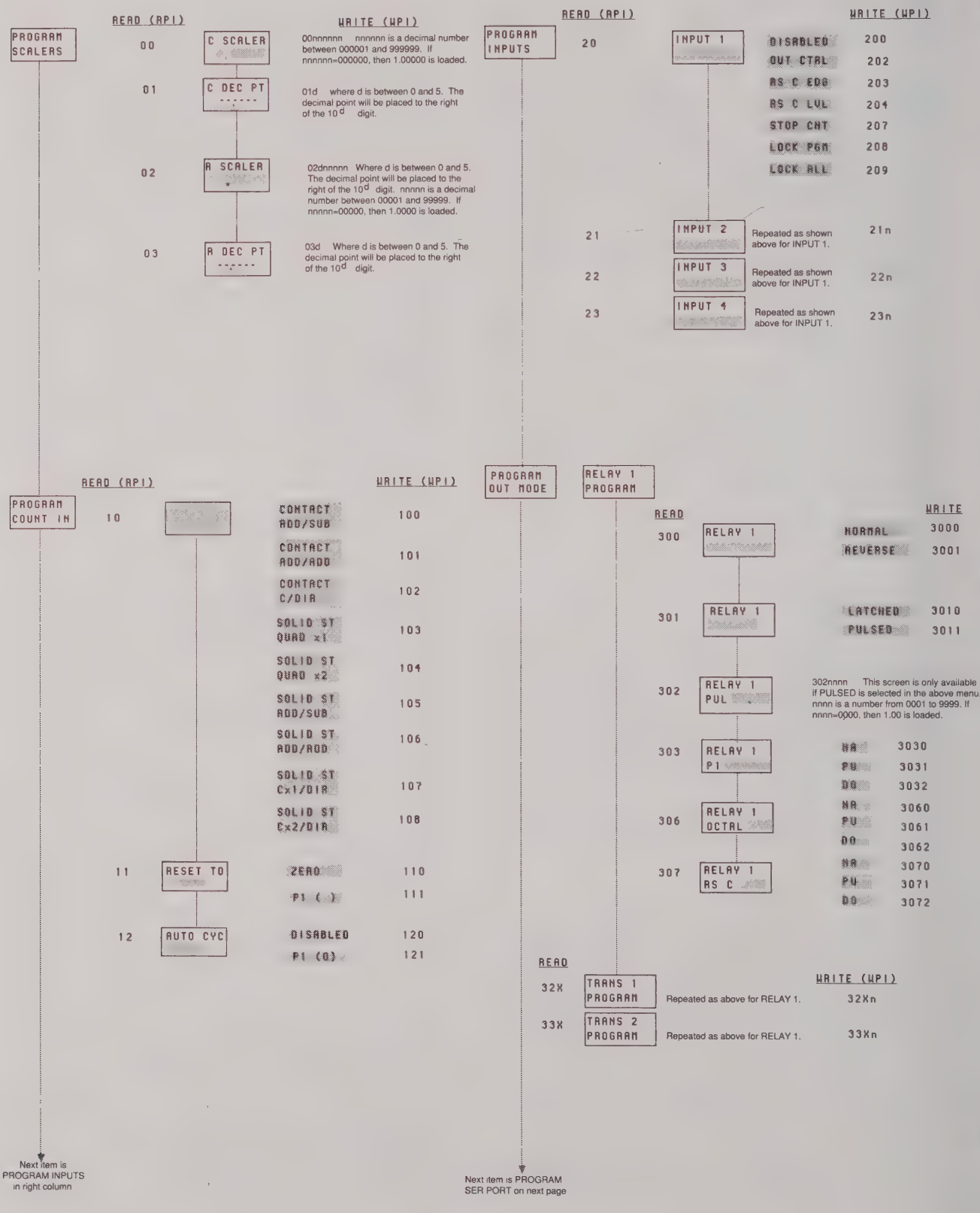
EXAMPLE RESPONSE: A200D3(cr) Input 1 is disabled.

SAMPLE COMMUNICATIONS PROGRAM

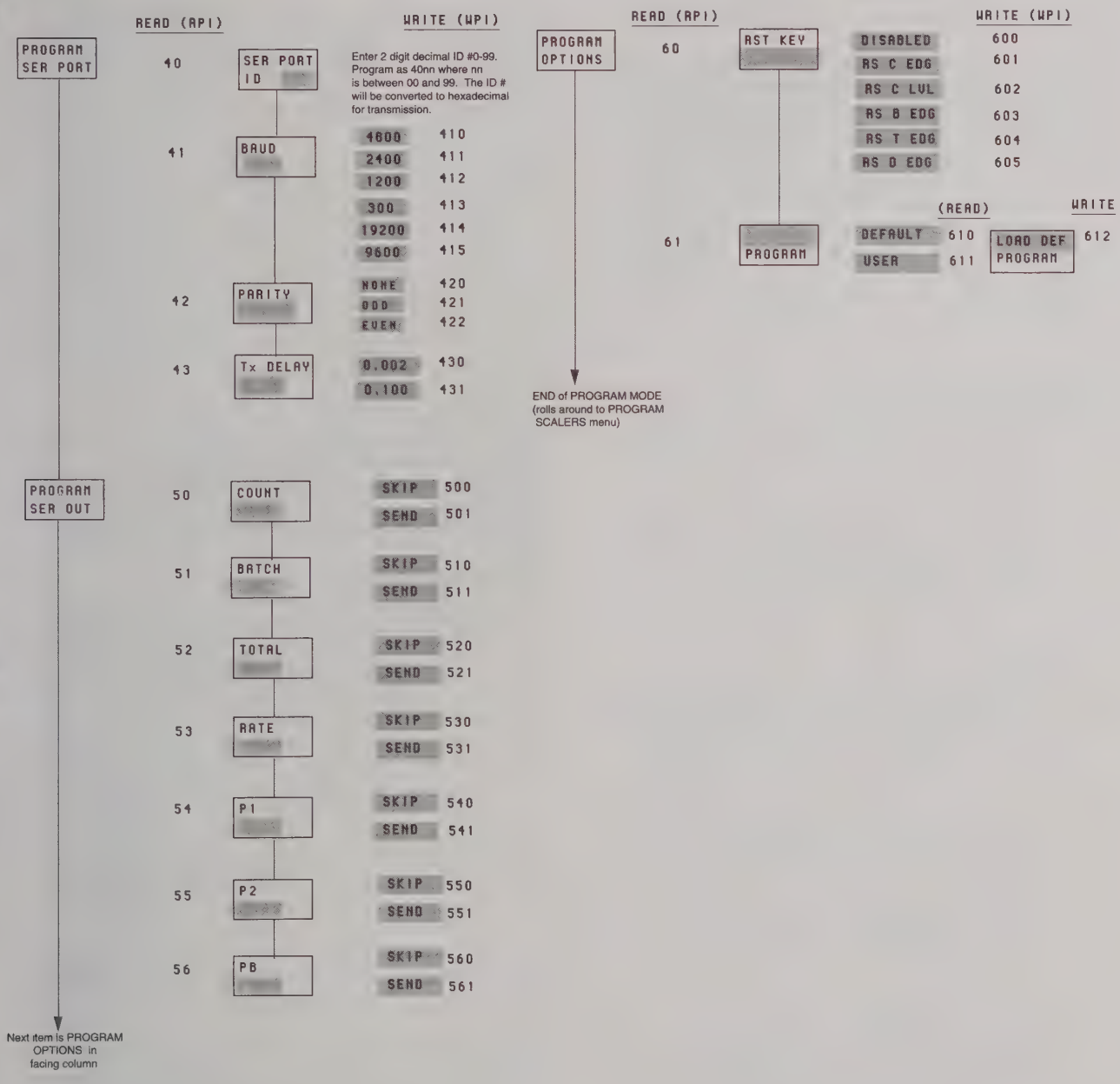
The following BASIC program can be used to demonstrate the serial communications capability of the Ambassador controls. The program requires the user to enter an Ambassador command with the correct unit ID# and format (example: 00WP1123456). The program will calculate the checksum and include it in the command string along with the preceding ">" character. The command string will then be printed to the screen and sent to the Ambassador unit (example: >00WP11234566E). The program then prints the Ambassador response to the screen (example: A).

Note: This sample program is intended for illustration purposes only and is not guaranteed to work with all computers and BASIC compilers or interpreters.

```
100 REM **** INITIALIZE AND INPUT *****
110 DEFINT A - Z
120 DEF SEG = &H40
130 CB = PEEK(1) * &H100 + PEEK(0)
135 DEF SEG
140 MSR = CB + 6
150 LSR = CB + 5
160 MCR = CB + 4
170 RTSON = 8 + 2 + 1 : RTSOFF = 8 + 1
180 OPEN "COM1:19200,N,8,1,RS" AS #1
190 ON TIMER(1) GOSUB 450
200 INPUT "ENTER COMMAND >", A$
210 REM ***** CALCULATE CHECKSUM *****
220 CS = 0
230 R$ = ""
240 FOR X = 1 TO LEN(A$)
250 CS = CS + ASC(MID$(A$, X, 1))
260 NEXT X
270 CS = CS AND 255
280 CS$ = HEX$(CS)
290 IF CS < 16 THEN CS$ = "0" + CS$
300 T$ = ">" + A$ + CS$ : PRINT T$
310 REM ***** RTS CONTROL AND SEND *****
320 OUT MCR, RTSON
330 PRINT #1, T$
340 IF INP(LSR) <> &H60 THEN 340
350 OUT MCR, RTSOFF
360 REM ********* GET RESPONSE *********
370 TIMER ON
380 IF LOC(1) = 0 THEN 380
390 R$ = R$ + INPUT$(LOC(1), #1)
400 TIMER OFF
410 IF RIGHT$(R$, 1) <> CHR$(13) THEN 370
420 PRINT R$
430 GOTO 200
440 REM ***** NO RESPONSE ROUTINE ******
450 PRINT "NO RESPONSE" : PRINT
460 TIMER OFF : RETURN 200
```


READ (RPI)
WRITE (WPI)
PROGRAM SCALERS
00
C SCALER
00nnnnnn nnnnnn is a decimal number between 000001 and 999999. If nnnnnn=000000, then 1.00000 is loaded.
01
C DEC PT
01d where d is between 0 and 5. The decimal point will be placed to the right of the 10d digit.
02
R SCALER
02dnnnnn Where d is between 0 and 5. The decimal point will be placed to the right of the 10d digit. nnnnn is a decimal number between 00001 and 99999. If nnnnn=00000, then 1.0000 is loaded.
03
R DEC PT
03d Where d is between 0 and 5. The decimal point will be placed to the right of the 10d digit.
READ (RPI)
WRITE (WPI)
PROGRAM INPUTS
20
INPUT 1
DISABLED 200
OUT CTRL 202
RS C EDG 203
RS C LVL 204
STOP CNT 207
LOCK PGM 208
LOCK ALL 209
21
INPUT 2
Repeated as shown above for INPUT 1.
21n
22
INPUT 3
Repeated as shown above for INPUT 1.
22n
23
INPUT 4
Repeated as shown above for INPUT 1.
23n
READ (RPI)
WRITE (WPI)
PROGRAM COUNT IN
10
CONTACT ADD/SUB 100
CONTACT ADD/ADD 101
CONTACT C/DIR 102
SOLID ST QUAD x1 103
SOLID ST QUAD x2 104
SOLID ST ADD/SUB 105
SOLID ST ADD/ADD 106
SOLID ST Cx1/DIR 107
SOLID ST Cx2/DIR 108
11
RESET TO
ZERO 110
P1 ( ) 111
12
AUTO CYC
DISABLED 120
P1 (0) 121
PROGRAM OUT MODE
RELAY 1 PROGRAM
READ
WRITE
300
RELAY 1
NORMAL 3000
REVERSE 3001
301
RELAY 1
LATCHED 3010
PULSED 3011
302
RELAY 1 PUL
302nnnn This screen is only available if PULSED is selected in the above menu. nnnn is a number from 0001 to 9999. If nnnn=0000, then 1.00 is loaded.
303
RELAY 1 P1
NR 3030
PU 3031
DO 3032
306
RELAY 1 OCTRL
NR 3060
PU 3061
DO 3062
307
RELAY 1 RS C
NR 3070
PU 3071
DO 3072
READ
WRITE (WPI)
32X
TRANS 1 PROGRAM
Repeated as above for RELAY 1.
32Xn
33X
TRANS 2 PROGRAM
Repeated as above for RELAY 1.
33Xn
Next item is PROGRAM INPUTS in right column
Next item is PROGRAM SER PORT on next page

SERIAL PROGRAMMING



SELF-TEST ROUTINES

The 5760X-401 counter has several built in self-test routines. The counter performs these tests each time power is applied. If questionable operation ever occurs, run the self-test routines by removing and re-applying power to the unit.

If one of the internal test routines discovers a problem, the counter displays the message "ERROR X" where X is a single digit test number. The counter will not operate when displaying an error code. All outputs will remain in the off (dropped-out) state. In the error mode, the counter responds to all serial commands with a "N" followed by the failed test number.

Description of tests

#0 - ROM (Read Only Memory) Test: This routine checks that the ROM which holds the counter's operating program, is not corrupted.

#1 - RAM (Random Access Memory) Test: This routine checks the read / write memory used by the counter for normal operation and communication.

#2 - Display Test: This routine checks the operation of the display driver.

#3 - Non-Volatile RAM Test #1: This routine checks the run data section of NOVRAM. This NOVRAM section retains all count and preset values while power is removed.

#4 - Non-Volatile RAM Test #2: This routine checks the user program section of the NOVRAM. This section retains all programmable options and parameters while power is removed.

#5 - Non-Volatile RAM Test #3: This routine checks the integrity of the NOVRAM".

What to do when a test fails

1. Immediately halt the machine or process being controlled by the counter. Record the displayed error number.

2. If the counter shows ERROR 0, 1, 2, or 5, run the self-tests again by removing and re-applying power to the counter.

   If the counter shows ERROR 3, press the front panel reset key. This will set all counters and preset values to zero and re-run all tests.

   If the counter shows ERROR 4, press the front panel reset key. This will reset all user programmable options to the factory default settings and re-run all tests.

3. If the same error occurs again there is a malfunction within the counter — return it to the factory for repair.

   If the counter does not display an error, the unit is OK and can be put back in service. Before starting the machine again, check all preset values and user programmable options to insure that these parameters have not changed. A serious safety hazard could result if the operating characteristics of the counter have changed.

TROUBLESHOOTING

Some of the troubleshooting steps which follow require the user to change the programming of the unit. **Be sure to restore all programmable options to their required settings before running any machinery with the counter.**

I. Display is Blank:

A. Check that incoming power is wired correctly. Connect a voltmeter to the power input terminals and verify that the correct voltage is being supplied to the counter.

B. Remove and restore power to the counter. If this corrects the problem investigate the following causes:

   1. Counter NOT properly grounded - check that terminal 4 is connected to a good electrical ground.

   2. Electrical noise spike from inductive loads - install R-C suppressors in parallel with any external solenoid or relay coils that the counter controls.

   3. Electrical noise spikes in power supplied to the counter - run power to counter from another source or install a power line filter.

II. Counter Will Not Count:

A. Check the count scale factor and verify that it is set to the correct value. Set the scale factor to 1.00000 and try counting again before proceeding any further with troubleshooting.

B. Test Counter using a manual count source.

   1. Remove any wires connected to terminals 19 and 20.

   2. Turn all dip switches off.

3. Reset all program parameters to the factory defaultsettings (enter the program mode and select the PROGRAM OPTIONS menu, select the USER PROGRAM sub-menu, select the LOAD DEF PROGRAM selection and press ENT).

4. Make and break a connection between terminals 4 and 20 using a jumper wire. The counter should count up each time the connection makes. If the counter does not count, send the unit to the factory for repair.

5. Make and break a connection between terminals 4 and 19 using a jumper wire. The counter should count down each time the connection makes. If the counter does not count, send the unit to the factory for repair.

C. If the counter counted from the manual count source in step B above, reconnect the sensor and select the correct dip switch setting. For sensors with a DC pulse output, perform steps 1 and 2. For magnetic pickup sensors, proceed to step 3 below.

1. With the sensor output in the high state, measure the voltage between DC Common and the count input. The voltage must be greater than 3.5 VDC. If it is lower, the sensor is defective, leaky, or is not compatible with the counter. With current sinking sensors, try adding a pull-up resistor (470 ohms to 4700 ohms) from terminal 1 to the count input. Note: for AC powered counters, the maximum current out of terminal 1 must not exceed 100 mA.

2. With the sensor output in the low state, measure the voltage between DC Common and the count input. The voltage must be less than 1.9 VDC. If it is higher, the sensor is defective, leaky, or is not compatible with the counter. With current sourcing sensors, try adding a pull-down resistor (220 to 2200 ohms) from the count input to DC Common. Note: for AC powered counters, the maximum current out of terminal 1 must not exceed 100 mA.

3. For magnetic pickup sensors, measure the AC voltage output of the sensor with the machine running. The output voltage should be greater than 0.45 volts RMS (1.2 volts peak to peak). If it is less, the sensor is defective, or the target is too far from the sensor, or the target is not moving fast enough.

III. Error message on display:

The message "ERROR" followed by a single digit number on the display indicates that the counter's internal self-tests have detected a problem. See the self-test section of this manual (page 24) to determine what caused the problem and how to solve it.

IV. Other Problems:

Other problems are usually caused by programming and/or wiring errors. Because of the versatility of this counter, it is impossible to include troubleshooting instructions for every situation that could arise. However, the following general troubleshooting steps should help in resolving specific problems:

1. Define, in detail, exactly what the problem is and when it occurs.

2. Use the block diagram and/or the menu programming diagram to determine which program options or parameters are related to the problem. Check their setting.

3. Determine which I/O circuits are related to the problem and check their operation with a voltmeter at the counter's terminal strips.

If going through the above 3 steps did not lead you to a solution, perform the following:

1. Record the wiring connections to each terminal on the unit.

2. Place the unit in the run mode and press the help key. Write down the 4 lines of data. The Ambassador help screens are provided as an alternate method of determining a unit's programming. The two help screens contain 32 characters of information. Pressing the HELP/• key displays screen 1. The characters are arranged as shown below:

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Help Screen Character Numbers - Screen 1

Press the down arrow key to display screen 2.

17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

Help Screen Character Numbers - Screen 2

3. Call the Durant application help line (800-334-4357) and ask for an application engineer to assist you with troubleshooting.

SPECIFICATIONS

POWER INPUT:

AC Operation:	115 VAC (+/-15%) std., 50 to 60 Hz, 7 W
	230 VAC (+/-15%) opt., 50 to 60 Hz, 7 W
DC Operation:	10 to 15 VDC opt., 300 mA maximum

DC POWER OUTPUT:

12 VDC (+/-25%), 100 mA maximum (includes all line and load variations)

ENVIRONMENT:

Operating Temperature:	32 to 131°F (0 to 55°C)
Storage Temperature:	-4 to 158°F (-20 to 70°C)

Operating Humidity: 85% Relative, non-condensing
NEMA 4 rating when mounted with gasket provided

PHYSICAL:

Case Dimensions:	2.64" (67mm)W x 2.64" (67mm)H x 5.60"(142mm)D
Bezel Dimensions:	2.95" (75mm)W x 2.95" (75mm)H
Panel Cut-out:	2.68" (68mm)W x 2.68" (68mm)H
Weight:	1.2 lbs. (0.54 kg.)
Display Size:	2 x 8 characters, 0.30" high

COUNTER:

Type:	Bi-directional
Digits:	6
Presets:	1
Reset modes:	Auto or manual reset to zero or preset
Scaler Range:	0.00001 to 9.99999
Decimal Point:	5 positions, programmable
Output Latency:	0.7 to 2 mS

COUNT SPEEDS:

The maximum count speed depends on the selected count mode. All maximum speeds are shown with square wave (50% duty cycle) input.

Mode (Inp A/Inp B)	Maximum Speed Solid state (high speed)	Contact (low speed)
Add/Sub	20 kHz	40 Hz
Add/Add	20 kHz	40 Hz
Count/Direction	15 kHz	40 Hz
Count x 2/Direction	7.5 kHz	N/A
Quadrature	6.5 kHz	N/A
Quadrature x 2	6.5 kHz	N/A

COUNT INPUTS:

Sink:	Impedance:	4.6k ohms to +5 VDC
	Voltage:	high 3.5 to 34.0, low 0.0 to 1.9 VDC
Source (high):	Impedance:	2.3k ohms to common
	Voltage:	high 3.5 to 17.0 VDC (100% duty cycle), low 0.0 to 1.9 VDC
Source (low):	Impedance:	2.3k ohms to common
	DC Voltage:	high 0.6 to 17.0 VDC, low -17.0 to -0.6 VDC
	AC Voltage:	17 VAC (48 V Peak-Peak) maximum

CONTROL INPUTS:

Impedance:	4.7k ohms to +5 VDC
Voltage:	High +3.7 to +24 VDC, Low 0.0 to .9 VDC
Response:	Minimum low 15 ms, minimum high 15 ms.

RELAY OUTPUT:

Type:	SPDT contacts
U.L. Ratings:	250 VAC, 360 VA Pilot Duty.

TRANSISTOR OUTPUTS (2):

Type: NPN open collector with transient protection
Maximum Voltage (off state): 30 VDC
Maximum Current (on state): 200 mA @ 1.3 VDC

COMMUNICATION:

Type: RS-485
Format: 1 start bit, 7 data bits (ASCII), 1 parity bit, 1 stop bit
Protocol: Opto-22 compatible
Speed: 300, 1200, 2400, 48009600 and 19200 baud
Parity: Odd, Even, None (space transmitted, ignore received)

COUNT ACCURACY:

100% when counter is operated within the specified count speeds and count signal high and low times.

RATE INDICATOR:

Type:	1/Tau
Digits:	6
Scaler Range:	0.00001 to 99999
Decimal Point:	5 positions, programmable
Accuracy:	+/-0.015% of reading
Update Time:	1 second, fixed
Zero Time:	10 seconds, fixed

CONNECTIONS:

Type:	Dual depluggable screw terminal strips
Conductor Size:	#14 - 22 AWG, solid, stranded, or fused (preferred)

Spare Parts

36172-202	Front Panel Gasket
48369-200	Mounting Clip
28748-200	Screw for Mounting Clip
48355-110	Terminal Strip - 10 Position
48355-112	Terminal Strip - 12 Position

Ambassador Family Accessories

48183-401	Desk Mount Kit (enclosure for flat surface mounting)
58801-403	RS-485 to RS-232 Communications Converter
58801-404	RS-485 to RS-232 Communications Converter (Europe)
38145-400	RS-485 Interconnect Kit
38146-xxxx	RS-485 Cable - xxxx is length in feet, specify with 4 digits (0500 = 500 ft)

General Accessories

48160-400	Input Signal Conditioner
48160-440	Timer Module (selectable time base oscillator)
48160-45x	Analog to Frequency Converter
49990-4xx	Simultaneous Input Processor (anti-coincidence counting from multiple input devices)
38091-400	RC Surge Suppressor
36059-45x	Solid State I/O Modules (AC Input and Output, DC Input and Output)

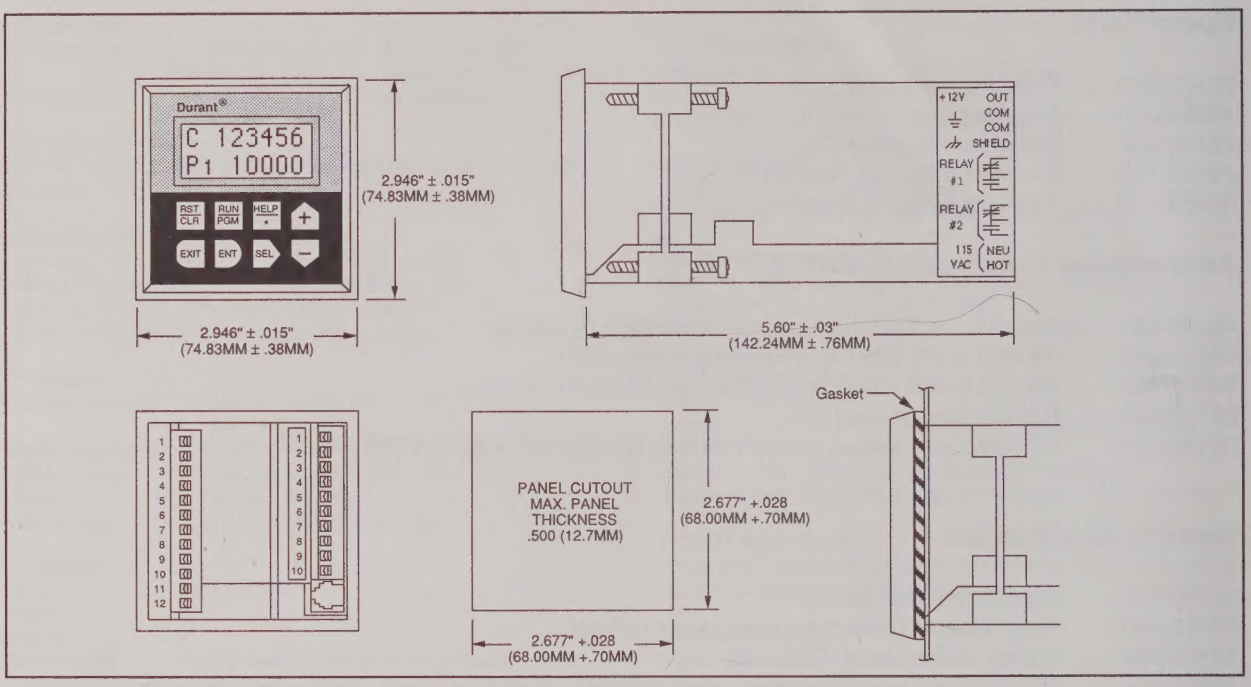
Transducers

48770-40x	Inductive Proximity Sensor (8mm, 12mm and 18mm sizes available)
48771-400	Diffuse Reflective Photoelectric Sensor
48771-401	Retro-Reflective Photoelectric Sensor
48771-404	Thru Beam Photoelectric Sensor Receiver (requires an Emitter)
48771-402	Thru Beam Photoelectric Sensor DC Emitter (requires a Receiver)
38150-xxxx	Medium Duty, single channel Shaft Encoder
38151-xxxx	Medium Duty, quadrature Shaft Encoder
48370-xxxx	Heavy Duty, single channel Shaft Encoder
48371-xxxx	Heavy Duty, quadrature Shaft Encoder
ES9513-RS	Rotary Contactor
39400-400	Zero Speed Vane Pickup
47004-400	Magnetic Pickup
28433-400	30 Tooth Gear for Magnetic Pickup

Ambassador Family Products

5760x-400	Totalizer With Rate
5760x-401	Single Preset With Rate
5760x-402	Single Preset With Rate, Batch & Totalizer
5760x-403	Dual Preset With Rate
5760x-404	Dual Preset With Rate, Batch & Totalizer

OVERALL DIMENSIONS



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